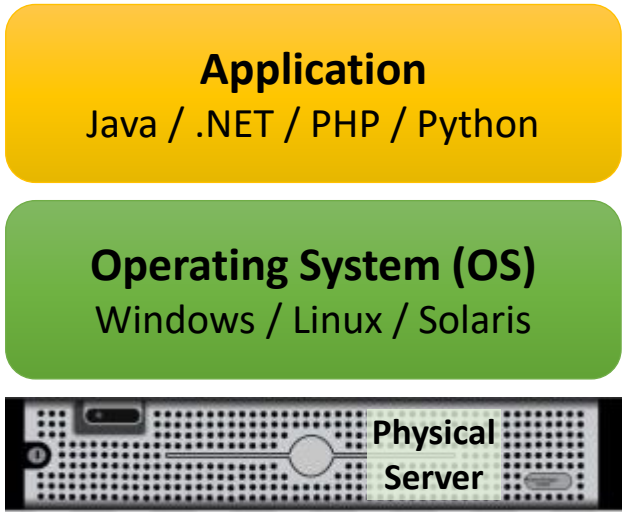
Compute in Cloud

What is compute?

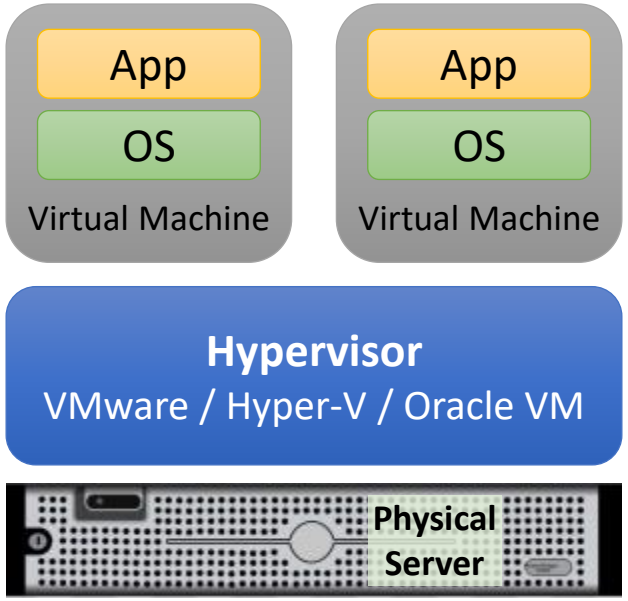
- Compute is a generic term used to reference processing power, memory, networking, storage, and other resources required for the computational success of any program.
- These resources can be physical or virtual.

Physical Server vs. Virtual Machine



Traditional Approach

Average Server Utilization ~ 5/10 %

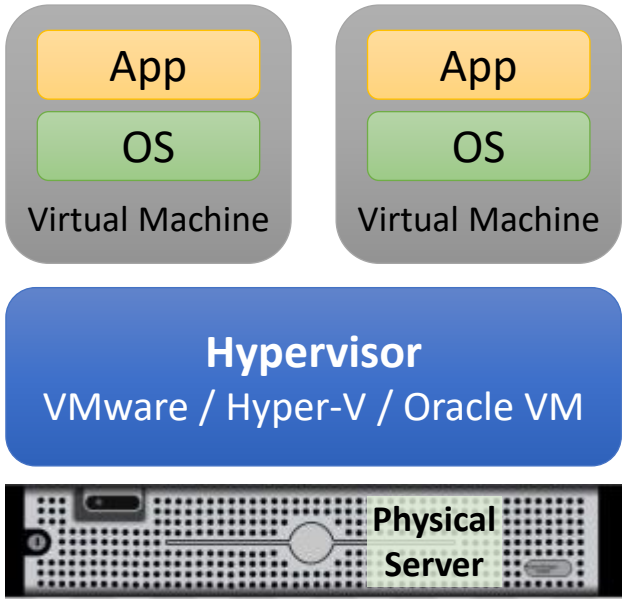


Virtualization Approach

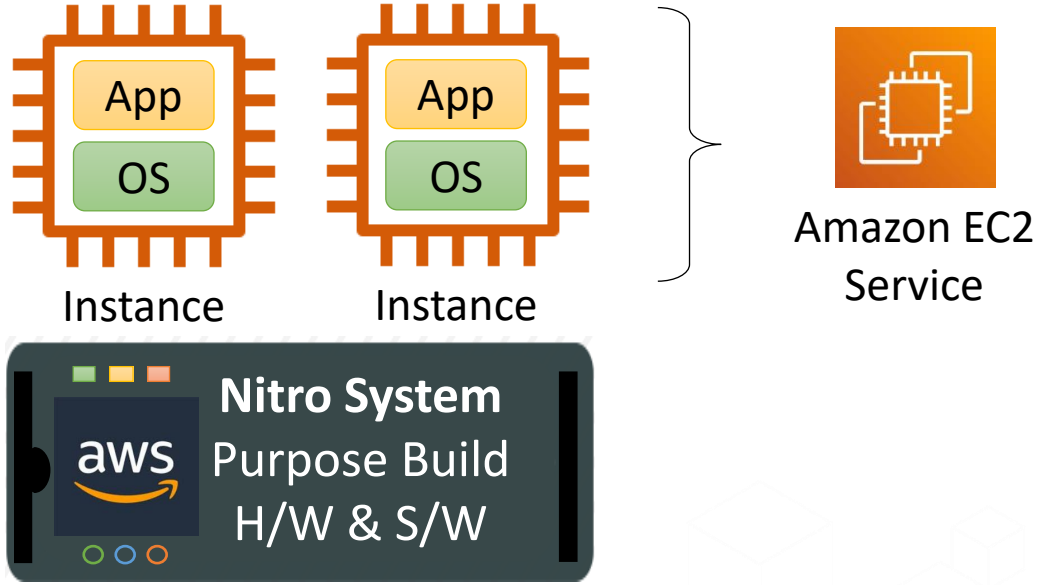
Average Server Utilization ~ 70/80 %

- Virtual machine is digital version of a physical computer.
- A virtual machine can perform all the same functions as a physical computer, including running applications and operating systems.
- They may also require maintenance such as updates and system monitoring.

Amazon Elastic Compute Cloud (EC2) – Virtual Server in Cloud



Virtualization Approach

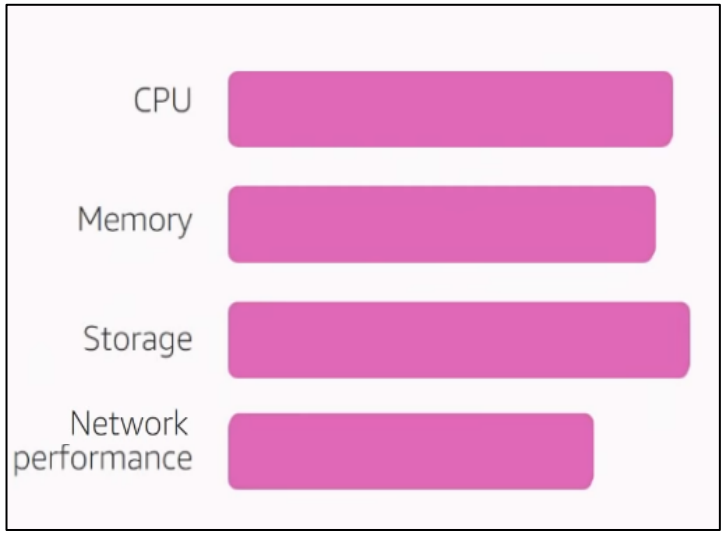


AWS Approach

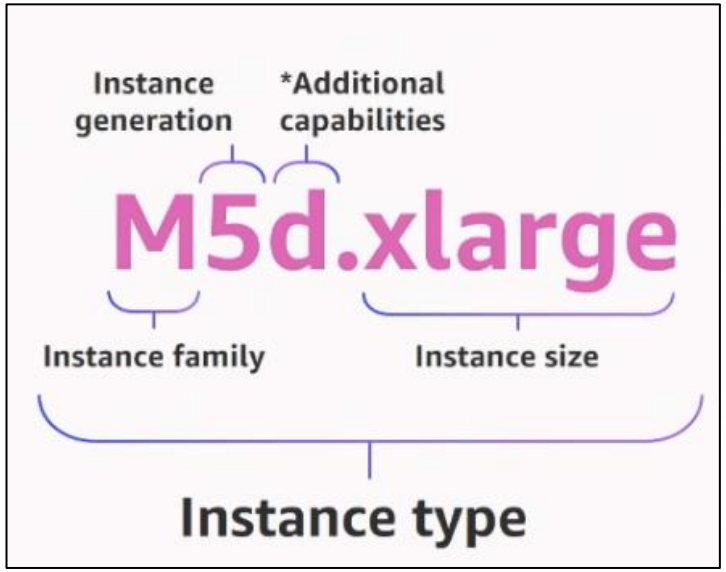
Amazon EC2 Instance

Provisioning an EC2 Instance

- AMI – Amazon Machine Image
  - Template of common OS images
    - Quick Start
    - My AMI
    - Marketplace
    - Community



- Instance Type
  - Performance Characteristics
  - Optimized for different workloads
  - Elastic – Can be changed later
  - Region Specific



User Data

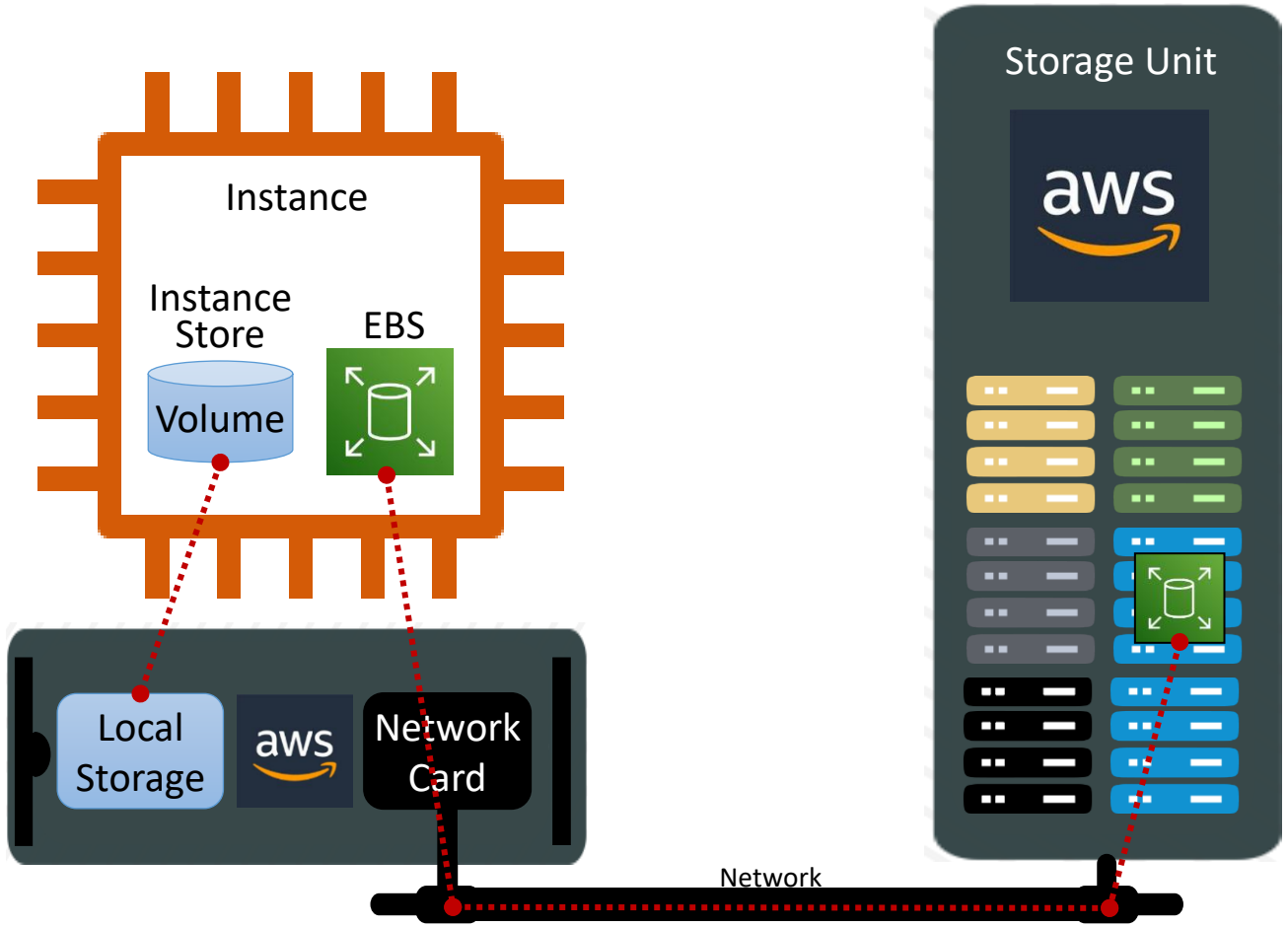
- Customize your instance at launch

```
#!/bin/bash
yum update -y
yum install httpd -y
echo "<html><body><center><h1>Welcome to AWS. Here is my web  page!
</h1></center></body></html>" > /var/www/html/index.html
systemctl start httpd
systemctl enable httpd
```

Amazon EC2 Storage

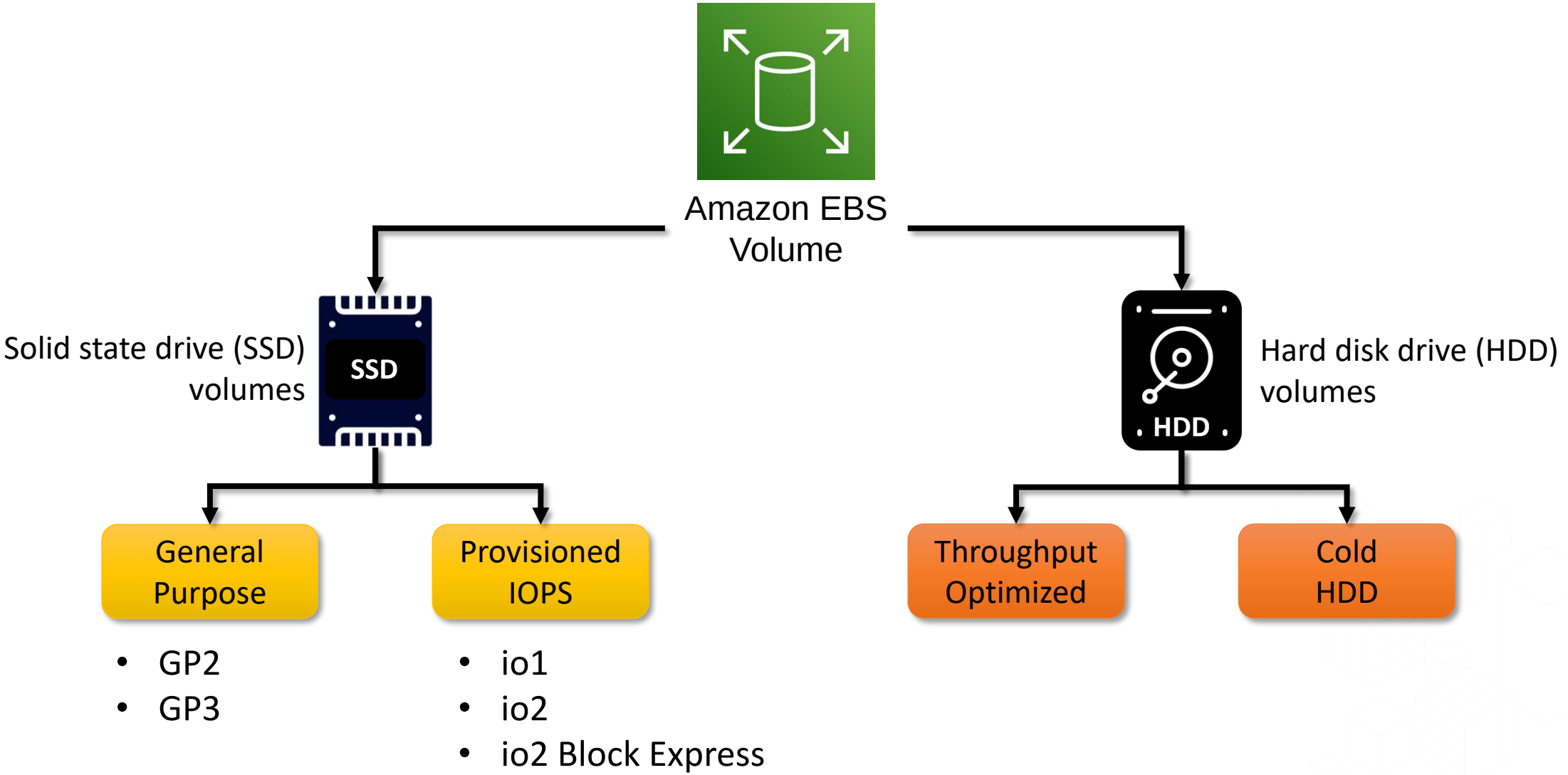
EC2 Storage Options – Block Storage

- Instance Store
  - Local Storage
  - Ephemeral
  - Limited Size
  - Not available on all instance types
  - Use case
    - Swap space
    - Temp. Storage



- Elastic Block Store (EBS)
  - Over Network
  - Persistent Storage
  - 64 TB Max Size
  - Choice of volume types
  - EBS Optimized instance type*
  - Use case
    - Any block storage need (OS/DB/Log)

Amazon EBS Volume Types



Amazon EBS Volume

- Specific to a AZ
- Choose based on performance/price
- Can be expanded (can’t shrink)
- Can be changed while instance is running

- Supports Snapshot
- Snapshots can be copied to another Region or account
- Supports encryption
- Attached to Single EC2 Instance*

Reference:

FAQs

Category:

Storage

Amazon Elastic Block Store (Amazon EBS)

What?

- Amazon Elastic Block Store (Amazon EBS) is a block-storage service designed for Amazon EC2. Once attached to Amazon EC2 instance, you can create a file system on top of these volumes, run a database, or use them for any other block storage need.
- Data stored on an Amazon EBS volume can persist independently of the life of the instance.

Why?

- Amazon EBS allows you to right-size your storage for performance and capacity by dynamically increase capacity, tuning the performance, and changing the type of live volumes with no downtime or performance impact.
- It can be used to migrate on-premises storage area network (SAN) workloads to the cloud.

When?

- Amazon EBS includes two major categories of storage: 1. SSD-backed storage (io2, io2 Block Express, io1, gp3, gp2) - for transactional workloads (performance depends primarily on IOPS, latency, and durability) and 2. HDD-backed storage (st1 and sc1)- for throughput workloads (performance depends primarily on throughput, measured in MB/s).

Where?

- Amazon EBS volumes are placed in a specific Availability Zone. Volume in an AZ can only be attached to instance in the same AZ. Volumes are protected against failure with 99.999% availability, including auto replication within AZ.
- You can create point-in-time snapshots of EBS volumes, which are persisted to Amazon S3.

Who?

- You dynamically change the configuration of a volume attached to an instance.
- You can take a snapshot of an Amazon EBS volume and then restore it in another AZ if needed. Amazon EBS Snapshot (not volumes) can be copied across regions and can be shared publicly or with specific AWS accounts.

How?

- Select the right volume type based on your application's needs and cost and attach it to either new or existing EC2 instance.
- Once attached, it will appear as a mounted device similar to any hard drive or other block device. Afterwards, the instance can interact with the volume as it would with a local drive, formatting it with a file system or installing applications on it.

Created by:

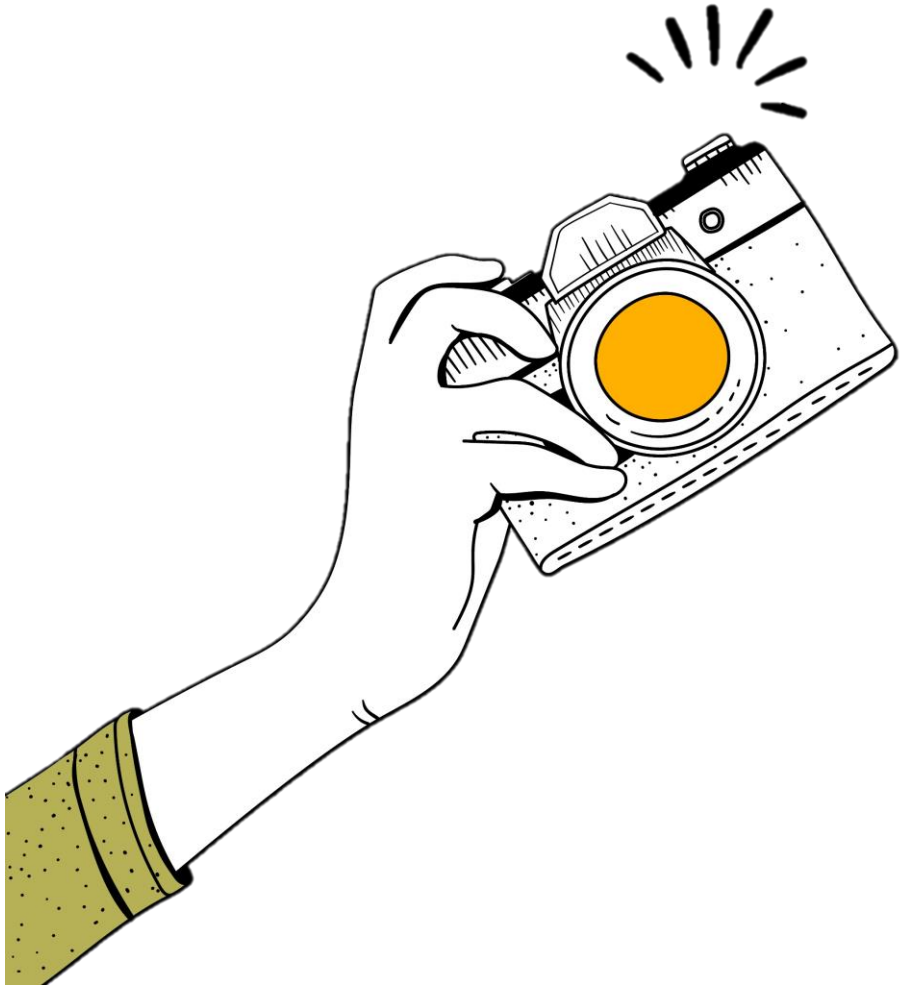
Ashish Prajapati

How much?

- Two factors determine pricing for Amazon EBS Volumes – the amount of GB you provision and additional input/output operations per second (IOPS) and throughput beyond baseline performance.
- For Amazon EBS snapshots you pay Storage Pricing (GB-month), Restore Pricing (GB of data retrieved) and API calls.

Amazon EBS Snapshot

Snapshot



WordWeb

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snapshot

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Noun: snapshot 'snap,shót

1. An informal photograph; usually made with a small hand-held camera
   "my snapshots haven't been developed yet"
2. A quick look at something; a brief overview
3. (computing) a record of data or state at a particular time

Amazon EBS Snapshot

- EBS Snapshots are a point-in-time copy of your data.
- It can be used to enable disaster recovery, migrate data across regions and accounts, and improve backup compliance.
- The snapshots are automatically saved to Amazon S3 for long-term retention.
- Amazon EBS Snapshots are incremental, storing only the changes since the last snapshot.

Reference:

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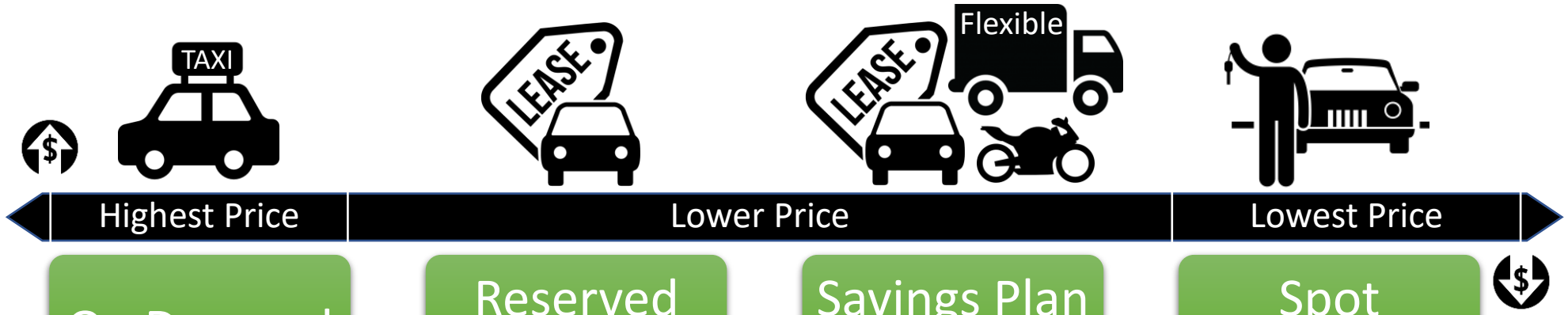
Amazon EC2 Pricing

EC2 Purchase Options



On Demand

- Pay by second – Amazon Linux Ubuntu and Windows
- Pay by hours – Other Operating Systems
- Unpredictable workload

Reserved Instance

- 1 Year or 3 Year commitment
- Long running and predictable workload
- Reserve Region / AZ / Instance Type / OS

Savings Plan (RI 2.0)

- Commitment of a fixed payment
- Flexible in terms of reservation

Spot Instance

- Unused capacity of AWS infrastructure
- Supply and demand based pricing

Reference:

FAQs

Category:

Compute

Amazon EC2

What?

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable computing capacity—literally, servers in Amazon's data centers—that you use to build and host your software systems.
- An instance is a virtual server in the AWS Cloud.

Why?

- Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change.
- Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use.

When?

- Run cloud-native and enterprise applications, Scale for HPC applications, Develop for Apple platforms.
- You want complete control of your computing resources and run it on Amazon’s proven computing environment.
- You want to import your virtual machine images to Amazon EC2.

Where?

- Amazon EC2 is a regional service. An EC2 Instance runs in an Availability Zone.
- By launching instances in separate Availability Zones, you can protect your applications from failure of a single location.

Who?

- Customer must take care of OS patches, high availability and scaling. AWS provides tools and services for Patch Management, Auto Scaling, Monitoring, Backup and Vulnerability Scanning.

How?

- Select an AMI (Amazon Machine Image) >> Select Instance Type >> Select Additional Settings (Disk Size / Security Group Setting / Network / Start-up Script etc.).

Created by:

Ashish Prajapati

How much?

- On-Demand Instance – Pay per second / hour.
- Reserved Instances / Savings Plan – Commitment for 1-year / 3-year term.
- Spot Instances – Supply and Demand based pricing. May be terminated by AWS after giving a 2 min notice.